



RESEARCH AND TECHNOLOGY CONNECTIONS

Corporate Research & Development

In 2008, American firms ranked Germany as the number one business location in the EU for focused regional investment. American businesses also value the high standards of university-level education in Germany and non-university research facilities also enjoy an excellent reputation. Also important are the close interaction between public and private sector, outstanding transportation and communication infrastructure, and Germany's location in the heart of Europe (*Source: AmCham Business Barometer 2009*)

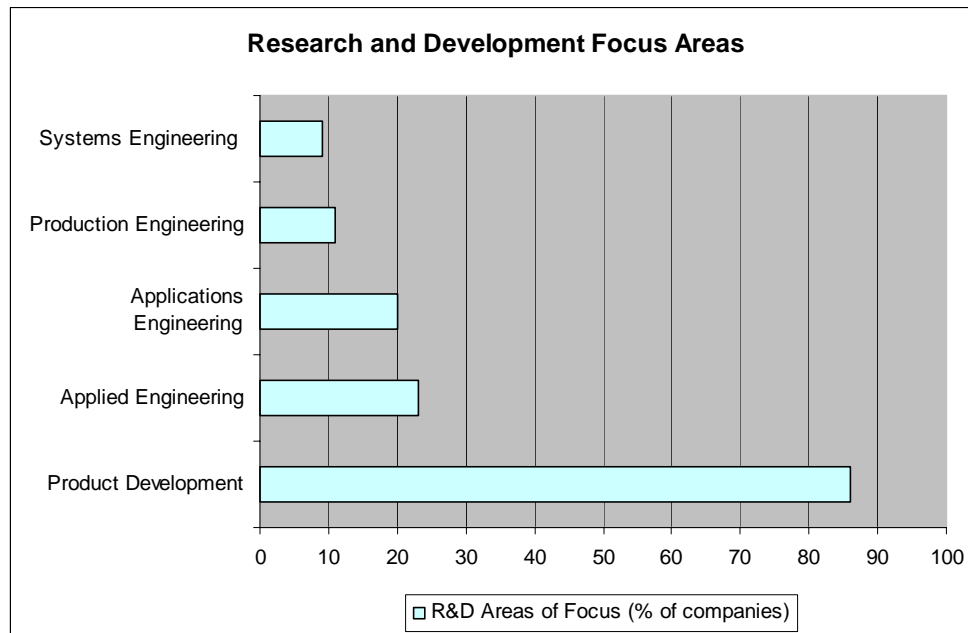
- Germany is a highly valued location for competence centers and many important technological innovations originate in Germany. Germany ranks third in the world for total non-resident patent holders and holds more U.S. patents than any non-U.S. country but Japan.
- 10 of the top 25 innovation regions in Europe are located in Germany, including Oberbayern, Karlsruhe, Stuttgart, Braunschweig, Berlin, Tübingen, Darmstadt, Dresden, Cologne and Mittelfranken (*Source: Regional Innovation Scoreboard 2006*).
- Ernst & Young's 2008 European Attractiveness Study found that the U.S. and Germany were rated as the first and third most dynamic countries in terms of innovation and education.

Major U.S. Companies in Germany are involved in extensive R&D efforts and employ, on average, 15% of their workforces in research. Companies are engaged primarily in product development research, but also in various areas of engineering research.

Selected U.S. companies in Germany with the highest percentage of employees in R&D

| Company | R&D Employees | Total Employees in Germany | Percentage employed in R&D |
|-----------------------|---------------|----------------------------|----------------------------|
| Adam Opel | 4,984 | 23,500 | |
| Ford-Werke GmbH | 2,400 | 24,000 | |
| Procter & Gamble | 1,200 | 16,000 | |
| Abbott GmbH & Co. KG | 783 | 4,000 | |
| AMD Saxony | 750 | 3,000 | |
| 3M Deutschland | 575 | 4,442 | |
| TRW Automotive Gruppe | 500 | 11,400 | |
| Avaya GmbH & Co. KG | 345 | 3,689 | |
| Texas Instruments | 330 | 1,400 | |
| Motorola | 322 | 1,354 | |

R&D areas in which businesses are most actively engaged



Survey question: "In which R&D areas is your business most actively engaged?"

(Applied Engineering, Production Engineering, Applications Engineering, Product Development, Systems Engineering)

*Note: Multiple answers could be given. 44 responses were evaluated.

Renewable Energy

Germany has committed itself to reducing greenhouse gas emissions to 40% below 1990 levels while phasing out nuclear power by 2020 and, as such, is deeply committed to renewable energy. Germany is also home to the strongest renewable energy industry in the world. The German government's Meseberg plan calls for 25-30% of electricity generation to come from renewable sources by 2020. The Obama administration has called for 25% by 2025. Germany's renewable energy law (EEG) allows priority grid access and preferential tariffs to customers with renewable energy sources and is one of the main driving forces for Germany's renewable energy industry.

Wind Energy

Wind is an important renewable energy source for both Germany and the U.S., which are the two largest consumers of wind energy in the world. German and American companies have extensive ties in the wind energy sector.

- As of the end of 2008, the total installed German capacity for electricity generation from wind is 23.9 GW. Only the U.S. has a higher capacity with 25.2 GW.
- In 2008, the U.S. government has committed \$50 million for wind R&D and plans to spend \$53 million in 2009. The German government has committed €50 million over five years for offshore wind research and development at its Alpha Ventus wind power site in the North Sea.

- U.S. private equity firm Blackstone is committed to invest over €1 billion (\$1.57 billion) in the Meerwind project, a wind power site in the North Sea. The 80 windmill, 400mW project is led by Berlin-based Windland Energieerzeugungs GmbH and is scheduled for completion in 2012.
- Siemens operates a Wind Turbine Research Center in Boulder, CO that employs 50 people. Siemens' Energy and Automation division, which manufactures mechanical drives for wind turbines, plans to build a plant in Illinois that will create 350 new jobs.
- German wind turbine maker Nordex announced in June 2008 that it will spend approximately \$100 million over the next five years to establish production facilities in the United States.
- General Electric's European Renewable Energy Center of Excellence in Salzbergen employs over 1,000 workers producing wind turbines for the European market.
- The world's largest wind energy trade fair takes place in Husum, Germany and is attended by many American companies, including General Compression and KR Windpower.

Solar Energy

Solar energy is also an important part of the German and U.S. renewable energy portfolios. Germany is a world leader in photovoltaic and concentrated solar power research. Both governments provide financial support for solar development and research. Through its Solar America Initiative, the U.S. government has already awarded over \$340 million for industry R&D projects for photovoltaic cells.

- SolarWorld AG, a German company, operates the US' largest solar plant in Hillsboro, Oregon.
- Wacker Chemie AG of Munich announced in February 2009 that it would build a \$1 billion facility to produce polycrystalline silicon, a primary component in photovoltaic cells, in Charleston Tennessee.
- The German firm Schott Solar supplied the majority of the solar receivers for Nevada Solar One, the third largest concentrated solar power plant in the world.
- In 2008, General Electric expanded its renewable energy manufacturing facility in Salzbergen to include solar manufacturing.
- US-based First Solar, which is among the world's largest thin film producers, operates a solar module plant in Frankfurt an der Oder that employs over 500 people.
- The Massachusetts Institute of Technology and the Fraunhofer Society operate a joint research center focused on significantly reducing the cost of solar energy over the next five years. The MIT-Fraunhofer Center for Sustainable Energy Systems will develop cutting-edge technologies and materials for designing and producing better solar modules.
- In May 2008, San Francisco hosted the fourth annual Germany California Solar Day, an energetic exchange between U.S. and German experts and executives of the latest knowledge and trends in solar research.
- Intersolar trade shows, in both Europe and North America, attract hundreds of businesses annually from both sides of the Atlantic. The Intersolar trade show is based in Munich and is the biggest solar trade show in the world. San Francisco's Intersolar North America is the largest solar trade show in America.

Scientific Exchange Programs & Foundations

There is a long history of mutual support across the Atlantic for American and German scholars, researchers, and scientists of all fields. This ongoing relationship is especially strong in fundamental scientific research. Key examples of institutions, foundations, and fellowships that support this bilateral collaboration include the following:

The National Science Foundation is an independent federal agency created in 1950 in the U.S. to promote the progress of science. In 2007 alone, NSF awarded 138 awards to American scholars for research in Germany in fields such as polar and oceanic geochemistry, particle physics, geoscience, electromagnetics, and botany.

The Alexander von Humboldt Foundation provides fellowships for both young and experienced U.S. researchers to work in Germany. In addition, the foundation provides the German Chancellor Fellowship each year to ten emerging American leaders in any field.

The Robert Bosch Foundation sponsors a number of programs that mutually benefit German and American scientists and their work. One of these, the German Scholars Organization, works to support German scientists working in the U.S. in their professional and personal lives with services such as networking and access to job opportunities. The Bosch Foundation offers travel grants to 10 German scientific journalists each year to attend the American Academy for the Advancement of Science's annual conference.

The Fraunhofer Institute, which focuses on applied research, has 40 locations across Germany and six offices in America. In the U.S., Fraunhofer conducts research in laser technologies, molecular biotechnology, and experimental software engineering, among other fields. Fraunhofer also offers a fellowship program that invites 4 senior researchers from the U.S. to Fraunhofer Institutes in Germany each year for cooperation in fundamental and applied research.

In 2002, the German Research Foundation, Deutsche Forschungsgemeinschaft, opened a Liaison Office in Washington, D.C. to maintain contact with its many fellowship holders and to expand its cooperation with partner organizations in the U.S.

The Gottlieb Daimler and Karl Benz Foundation - which focuses on the relationships between humans, the environment and technology - has awarded over 110 grants since 1987 to German researchers to allow them to travel to America to conduct research.

Environment

The U.S. and Germany are active in several bilateral and international partnerships, programs, and initiatives that address the broad spectrum of pressing environmental issues, including greenhouse gas emissions, clean fuels, sustainable development and energy efficiency.

International cooperation projects both countries participate in include the Carbon Sequestration Leadership Forum. This initiative works to advance carbon capture and sequestration research, in order to produce cleaner energy from coal. The United States and Germany are also both

committed to the multilateral Methane to Markets (M2M) Partnership which aims to reduce global emissions of methane - a potent greenhouse gas - via collaboration between governments and private sector entities. Moreover, both countries are founding members of the International Partnership for the Hydrogen Economy, established in 2003. This Partnership conducts advanced research and development in hydrogen and fuel cell technologies.

The U.S. Environmental Protection Agency and the German Ministry for Education and Research (BMBF) entered into a bilateral partnership in 1990 on innovative approaches to remediating contaminated land (brownfields). The partnership focuses on model projects, best practices, and information sharing between American and German sites.

The U.S. Green Building Council (USGBC) is a non-profit trade organization that promotes sustainability in the design, construction and operation of buildings. The USGBC developed the Leadership in Energy and Environmental Design (LEED) third-party rating system in 1998. The German Sustainable Buildings Council (Deutsche Gesellschaft für Nachhaltiges Bauen) was founded in July 2007; it has also developed a set of energy efficiency standards and a certification system for German buildings.

The German Federal Government has created an initiative in September 2008 called the Transatlantic Climate Bridge, which is meant as a way for the US and Germany to collaborate on climate change issues and increase business connections in renewable energy.

Medical Research

Medical research collaboration between the U.S. and Germany has a long, successful tradition in several fields such as cancer, immunotherapy and radiation.

A broad range of scientific cooperation agreements between German and American Institutes exists. In April 2008, the University of Texas M. D. Anderson Cancer Center in Houston signed a sister institution agreement to formalize its long-standing academic ties with the German Cancer Research Center (DKFZ) at the University of Heidelberg. Over the past 15 years, the two institutions have worked closely together on radiation oncology, neuro-oncology, immunotherapy, and blood cancer. In the same year, researchers at the University of Florida announced that they will work with the German biopharmaceutical company CureVac to test an experimental therapy for advanced prostate cancer patients who no longer respond to traditional treatment. Moreover, Biologists collaborating at the U.S. Department of Energy's Brookhaven National Laboratory, Stony Brook University, and the University of Wurzburg, Germany announced they had deciphered the structure of a large protein complex responsible for adding sugar molecules to newly formed proteins - a mechanism vital to understanding the variety of genetic disorders (characterized by problems including seizures, strokes and muscular dystrophy) caused when this process malfunctions.

Medical scientists at the German Research Center for Environmental Health (GSF) in Munich and their American colleagues at the University of Oregon in Eugene are working together to develop a better, lower dose CT scan (computed tomography is a medical imaging method).

The International Graduate School in Bioinformatics and Genome Research at Bielefeld University (North Rhine-Westphalia) hosts collaborates with a number of American researchers and PhD students on experimental genome research and bioinformatics.

Space Cooperation

Germany and the United States maintain a long tradition of joint aerospace cooperation between their two civilian space agencies, NASA (National Aeronautics and Space Administration) and DLR (Das Zentrum für Luft und Raumfahrt). This relationship is best exemplified by cooperation in manned space missions, joint research projects, and the International Space Station (ISS).

- **Manned Space Missions:** In 2006, Thomas Reiter became the first German astronaut to stay at the International Space Station (ISS) via Space Shuttle Discovery where he spent nearly one year. In February 2008, German astronaut Hans Schlegel served as a Mission Specialist on board Space Shuttle Atlantis' STS-122 mission to integrate the European Columbus laboratory into the ISS. This was not Schlegel's first experience working with Americans. In 1998, he trained at the Johnson Space Center in Texas and during his teenage years he was also a high school exchange student in Iowa.
- **ISS Columbus Laboratory:** Columbus is an €80 million multi-purpose ISS laboratory for multi-disciplinary research into weightlessness. Columbus was transported to the Kennedy Space Center (KSC) by a Beluga Airbus on 28th May 2006 and was launched to the ISS in February 2008. Although Columbus is a European Space Agency (ESA) project, the functional architecture was designed by EADS in Germany and the laboratory is operated by the European Columbus control centre within the German aerospace control center of the German Aerospace Agency (DLR) in Oberpfaffenhofen, Germany. (*Source: www.dlr.de*)
- **GRACE:** The Gravity Recovery and Climate Experiment (GRACE) utilizes two satellites to capture detailed measurements of the Earth's gravitational field enabling scientists to track the Earth's shifting water masses. The GRACE program is jointly operated by the GeoForschungsZentrum in Potsdam, the U.S. National Aeronautics and Space Administration's (NASA) Jet Propulsion Laboratory, and the University of Texas Center for Space Research. The two GRACE satellites were manufactured by Astrium of Germany.
- **SOFIA:** The Stratospheric Observatory for Infrared Astronomy (SOFIA) is a joint project of NASA and the German Aerospace Center (DLR), and will utilize an airborne test bed to study the structures of planetary atmospheres and surfaces; to investigate the structure, evolution and composition of comets; to determine the physics and chemistry of interstellar medium; and to study the formation of stars and other stellar objects. To accomplish this, NASA will supply a Boeing 747SP customized to house a German designed and manufactured infra-red telescope designed. SOFIA is expected to fly into the stratosphere, open the telescope cavity door, and point its telescope at the heavens three or four nights a week for at least twenty years.

Joint Technical Innovation

As two of the world's leading technical innovators, Germany and the United States have a strong history of combining their technical prowess and enhancing joint technical innovation to their mutual benefit. Abundant examples of this technical cooperation can be found with joint university research, cooperation between national laboratories, and private industry joint ventures. Although Germany and the United States are competitors in markets for many technical products, both countries clearly understand the advantage a robust symbiotic relationship has for the advancement of science and technology.

- The Hahn-Meitner-Institut (HMI) in Berlin, part of the Helmholtz Association of National Research Centers, has been working with the National High Magnetic Field Laboratory (NHMFL) in Florida since 2005 and both sites have hosted scholarly exchanges. In 2007, HMI and NHMFL signed an agreement to build an \$8.7 million hybrid magnet to use for neutron scattering experiments. When it is complete in 2011, it will be the world's strongest magnet for neutron experiments.
- In 1998, the German-American Frontiers of Engineering (GAFOE) symposium was founded. Since then, GAFOE symposia have been held every year in locations alternating between Germany and the United States. GAFOE invites approximately 60 outstanding, early-career German and American engineers from industry, universities and other research institutions to introduce their research work and foster collaborative networks of engineers from the two countries. The U.S. National Academy of Engineering and the Alexander von Humboldt Foundation are partners in this venture.
- The United States and Germany are two of the world leaders in nanotechnology research. The U.S. led all other countries on nanotechnology spending and patent applications. In 2008, the U.S. federal government budgeted \$1.4 billion for nanotechnology spending. According to the German Ministry for Education and Research, Germany is third in the world in terms of both nanotechnology spending and patent applications. Germany has nine networks of competence that deal specifically with nanotechnology.
- In June 2007, the venture capital division of the German chemical company BASF made a \$2 million investment to increase its share in the American start-up company SDC materials, which manufactures advanced metal, ceramic, and nano powders for use in the chemical, medical technology and automotive industries. As a result, SDC will increase its workforce and production facilities in both the U.S. and Germany.
- The American companies nCoat, Inc. (which develops nano-scale high performance coatings) and Sunvention USA (which focuses on solar development) announced an agreement for business collaboration and commercial product development with Germany's BSR Solar Technologies in January 2008. nCoat will provide advanced thermal and corrosion management coatings that will help protect the solar green energy systems developed by BSR and Sunvention.

U.S. Embassy Berlin. February 2009.